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EXCERPTS FROM [] TEST AND EVALUATION

25X1

OF

[] WIDE FILM PROCESSOR

25X1

The following test results and evaluation excerpts were taken from []

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[] Test and Evaluation Report TE 68-4 received by the Center on

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16 August 1968. Where possible, statements made [] on their evalu-

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ation [] are related to specific statements given by design

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proposal [] and by the DED contract monitor. Related item, numbers

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refer to statements listed under "Test Parameters".

ITEM	STATEMENT	REPORT PAGE NO.	RELATED ITEM NUMBERS (Test Parameters)
A	An examination of the processor after uncrating, as well as during and after installation, revealed no damage to the machine. One pump was easily secured. All support equipment was found to be in good condition. The exhaust blower motor was changed from 110 Vac to 220 Vac for more efficient operation.	1	-
B	All connections (plumbing, electrical, air and vacuum) were checked and found to adhere to specifications.	1	OK 5,6,12,23
C	All stainless steel and PVC work was excellent. Installation of the processor was accomplished without problems, due to minimal plumbing and wiring requirements.	1	OK 6,23

Declass Review by
NIMA/DOD

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ITEM	STATEMENT	REPORT PAGE NO.	RELATED ITEM NUMBERS (Test Parameters)
D	All systems were checked in sequence as outlined in the manual. Results were good in all aspects, with the exception of temperature and its control.	1	20
E	Air and vacuum units checked and accepted.	1 <i>OK</i>	-
F	Air sequegees, air bearings and vacuum roller accepted and considered well designed.	1 <i>OK</i>	6
G	Film transport of a total of 2,000 ft. each of 70mm and 9.5-inch thin and heavy base (including 500 ft. of heavy film leader) film was excellent. All tanks during this phase were water filled, and machine was in full operational configuration for dry-to-dry evaluation. No abrasions or edge distortions were noted.	1 <i>OK</i>	1,17
H	Temperature control was tested during all runs and temperature variations from liquid bearing impingement area of control indicator varied three to seven degrees. This phase was rechecked during the first sensitometric run and the differences ranged from two to three degrees.	2 <i>No mention of input temp of water.</i>	20
I	Electrical components all acceptable and meet specifications.	2 <i>OK</i>	6,12
J	The film magazine, due to modification, will not accept the Air Force 1,000 foot spool and the light trap remains open when attached to the machine. Use of an Air Force standard magazine, that adapts to the machine, and with a full 1,000 feet of film causes base abrasions in passing	2 <i>OK - changed to 570'</i>	15

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ITEM	STATEMENT	REPORT PAGE NO.	RELATED ITEM NUMBERS (Test Parameters)
J (Con)	through the entry slit to splicer section. Unless modified, the light trap on the Air Force magazine will remain in the "open" position. Opening of the splice area could fog loaded film.	2	15
K	Front take-up roller "drawer" required excessive force to remove and when in "operating" position, the air blast noise increases in intensity to an objectionable degree and causes continuous flutter of the film, which in turn causes lateral abrasions of the film.	2	<i>No longer true due to new dryer system.</i> 1,6,7,17
L	Speed control knob increments are too small for accuracy and require a tachometer to establish a true film trend speed. The use of the conversion chart to convert the arbitrary numbering system is of little value. As an example, the [redacted] Engineering Manual recommends a speed of 4.75 ft./min, for drying [redacted] film, but the increments on the conversion chart do not include this figure. A direct reading speed selector, calibrated in ft/min., is required.	2	<i>Controls to be changed. True reading film speed control to be added.</i> 12,18
25X1			
25X1			
M	Temperature control units, unless started with cool chemistry, are difficult to adjust. Calibrated controls on each unit would be of considerable value. Lack of a cooling system makes the required temperature adjustments a time consuming and tedious task, particularly in respect to the allowable tolerances involved in $\pm 0.25^{\circ}\text{F}$ control. (NOTE) In tests these tolerances were not held at the film impingement plane.	2	<i>True</i> 20,25

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ITEM	STATEMENT	REPORT PAGE NO.	RELATED ITEM NUMBERS (Test Parameters)
N	The drain pan should be extended to include the wash tank section and the drainage outlet should be made larger.	3 <i>Done</i>	3,5,11,12,23
O	Full opening of all tanks at one time is not possible due to limited pan capacity and small drainage opening.	- <i>Now possible.</i>	3,5,11,12,23
P	Noise level extremely high. The exhaust blower should be mounted away from work area and redesign of the dryer assembly is recommended in order to lower the noise level and reduce film flutter.	3 <i>Will be reduced due to modified dryer.</i>	6,7,12,17
Q	Leakage or spillage drains onto electrical motors and pumps.	3 <i>Corrected.</i>	3,8,9,23
R	1,000 foot roll pull through causes wrinkling at the 90 degree turn-around, take up idler roller.	3 <i>How about 500'</i>	1,7,17
S	Due to the power requirements and physical characteristics of the processor, it is estimated that a minimum of eight to ten tons of air conditioning will be required to maintain equilibrium for the specified $70^{\circ}\text{F} \pm 5^{\circ}$ and $50\% \pm 5\text{RH}$.	3 <i>Quite possible but new dryer design should reduce this considerably.</i>	²⁵
T	Dryer is inadequate and it is apparent that processing speeds, types and temperatures of chemistry are all dependent on the drying capability.	3 <i>New dryer.</i>	1,6,11,12,17
U	This phase of the test, although involving chemistry, will not be included in Section II, but will be mentioned at this point. Deficiencies noted, based on high temperature processing, are as follows:	3	10

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ITEM	STATEMENT	REPORT PAGE NO.	RELATED ITEM NUMBERS (Test Parameters)
U (con)	(1). The ratio of metol of hydroquinone is high.	?	
	(2). Sodium sulphite concentration is not high enough.	?	
	(3). It is our opinion that borax should be added to the hydroxide alkali buffer system.	?	
	(4). Sulfate should be added to prevent the excessive swelling which is one of the primary reasons for the film drying problem.	?	
V 25X1	The [REDACTED] Processor, as a prototype, is good in concept with exceptions; noted in paragraph B-1-H. The air knife and liquid bearing-applicator principles have been well adapted to the photographic process, and they do establish that it is possible to transport film with little or no abrasions, scratches or other defects that have been one of the major problems in film processing machines. The dryer section is poor in design. The loading design and drying section negated the possibility of transporting film dry-to-dry with no abrasions in the processors present configuration.	4	1,7,8,17
W	From an engineering standpoint, the machine, as a prototype, is acceptable if the deficiencies noted are corrected. This recommendation does not include or pertain to the acceptability of the processor as a sensitometric, chemical, or controlled process machine.	4	1,6

New Dryer + 500' lead.

OK.

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ITEM	STATEMENT	REPORT PAGE NO.	RELATED ITEM NUMBERS (Test Parameters)
X	Evaluation and subsequent testing were accomplished as outlined in Appendix I, but due to the deficiencies noted in Section I Engineering Evaluation, the complete series of sensitometric tests was not considered feasible at this time.	5 <i>OK</i>	1,10,11,19
Y	Sensitometric curves representative of processing runs indicate that high temperature and high turbulence (Potential oxidation of developing agent(s) upset the formula balance, creating instability in the sensitometric control. The replenishment is based on a "demand" principle and varies from 1 to 3 quarts of developer during the processing of 500 feet of film, (70mm and 9.5-inch wide). Replenishment of other solutions vary according to capacity of their respective tanks. A foam build up was apparent in the wash section. Although not excessive, it caused a slight overflow around the edge of the cover.	5 <i>should be corrected when installed here & tied into tank farm.</i>	1,4,9,10,11,19
Z	Limited sensitometric testing was done with [redacted] film.	5	1,10,19
25X1	Dryer problems encountered in testing [redacted] prevented a thorough evaluation of this film.	}	
25X1	NOTE: Discussion with the using agency resulted in limiting the testing of the two duplicating and one acquisition film; therefore, only the NRD-29 developer was used in accordance with the [redacted] Manual.		

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ITEM	STATEMENT	REPORT PAGE NO.	RELATED ITEM NUMBERS (Test Parameters)
AA 25X1 25X1	Testing of the [] fine grain duplicating film and [] acquisition film showed good drying of these materials is possible; although the temperature control of the infrared heater unit was somewhat critical. High velocity air turbulence in the dryer section caused lateral abrasions on both film types.	5	1,10,19
25X1 25X1 25X1	Lateral density plots showed variations on [] film up to .04 density. Density variations on [] film were as high as .06 at a nominal density of 1.5.		
BB	The [] wide film processor prototype, from the stand-point of precision, high quality controlled processing, is not acceptable.	6 JK	1,10,19
CC 25X1	Sensitometric control is not possible and can be attributed to the Replenishment System which is a "demand" type system. On a processor of this design, it is not controllable. For precision processing it was noted that the developer replenishment bottle, due to back pressure in the circulation system, received "back up" of oxidized developer. The unpredictable flow of chemicals and the lack of sufficient fresh chemistry in the system not only changed the chemical balance, but a definite increase in KB_r was noted. High temperature processing required by the short developer time in the processor will require chemistry other than recommended in the [] Manual.	6 see Henry	1,9,10,19

Corrected by new dryer.

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ITEM	STATEMENT	REPORT PAGE NO.	RELATED ITEM NUMBERS (Test Parameters)
DD	In the dryer section, the infrared, in conjunction with warm air impingement, required critical and balanced control and could be considered extremely difficult with the existing configuration and control system. The distance between the wet section air knife, and the infrared area, then into the film guide air cluster, is too short. At this critical point drying is minimum upon entry into the cluster causing the flutter abrasions to be unacceptable by normal standards.	6 <i>Corrected w/new dryer.</i>	1,17
25X1 EE	The Processor is not acceptable in its present design as a controlled process unit.	6 ✓	1

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TEST PARAMETERS

The following work statements have been extracted from design

25X1 proposal [] This proposal is an integral part of the contract
for the prototype development of the [] Wide Film Processor. 25X1

Item	Statement	Proposal Page No.
25X1 1	...a prototype [] processor that will properly process wide film (70mm to 9- $\frac{1}{2}$ inches) to archival standards.	1-1 <i>Still Valid.</i>
	The machine will handle photographic films from 70mm to 9- $\frac{1}{2}$ inches wide with a base thickness range of 0.002 to 0.007 inch, coated on mylar, acetate, or other suitable support.	2-8 <i>Still Valid.</i>
25X1 2	As compared with conventional wide-film processors of similar quality, the proposed [] processor will be approximately one-fourth the cubage and one-fifth the weight, including support equipment.	1-1 ? <i>Size & weight of conventional processor</i>
	The machine design will emphasize compactness. The overall length will not exceed 10 feet, and a length of 8 feet will be a design goal.	2-6 <i>Still Valid.</i>
3	...the machine would require nominal attention and very little maintenance...	1-2 <i>Doubtful. - Will require considerable maintenance and constant attention</i>
	The design of the machine will facilitate easy and rapid cleaning without danger of damage to machine parts.	2-8 <i>Easy & rapid cleaning is in doubt. Will have to see.</i>
4	The heat-shock technique aids materially in producing high-quality imagery under short access conditions. A side effect is an apparent increase in effective film speed.	1-4 ? <i>A statement</i>
	Heat shock is effective in eliminating undesirable grain growth... Because the gelatin is exposed to the elevated temperature for such a short period, it does not have an opportunity to swell. Therefore, grain clumping is reduced, reticulation is eliminated, and drying becomes easier.	2-15 ? <i>Statement.</i>

Item	Statement	Proposal Page No.
5	The efficient washing system should result in processing with a fraction of the amount of water consumed by more conventional processors. The machine will operate from a constant-temperature water supply whose temperature range shall not exceed 68°F. minimum or 80°F. maximum. Water consumption will be minimized.	1-4 <i>Don't know - will have to ascertain when installed.</i> 2-10 <i>Ditto</i>
6	The selection of all components and materials will be on the basis of optimum quality, reliability, and maximum suitability for the particular application. All materials and components will be selected for high quality, reliability, and suitability for their task. Corrosion-resistant materials and fabrication methods shall be used wherever parts are exposed to corrosive chemicals or chemical fumes.	1-4 <i>Valid.</i> 2-10 <i>Valid.</i>
7	The film is supported by a fluid cushion, either liquid or air. The film makes no physical contact with any solid surface from the feed spool <u>to the drier exit</u>; hence, the film is not scratched or degraded. In addition, the film <u>travels in a straight path...</u> Consequently, the film is not subjected to stress or flexing nor is it under tension that could distort the image. The machine will be designed to transport film without serpentineing or excessive flexing <u>in the wet sections</u>. The film base and emulsion will not contact solid parts in the <u>processing section</u> of the machine.	2-1 <i>modified drier unit makes this impossible.</i> 2-1 <i>Valid.</i> 2-8 <i>Valid.</i>
8	The most significant feature of the design is a miniaturized Super-Levitron type of air lock between the liquid chambers. This virtually eliminates liquid carryover. The machine design will intrinsically minimize carryover of solutions from one processing chamber to the other.	2-1 <i>Valid.</i> 2-8 <i>Valid.</i>

<u>Item</u>	<u>Statement</u>	<u>Proposal Page No.</u>
9	A turbulation pumping system is installed for each chamber in the wet section. These constantly recirculate the chemicals so that fresh solution is available to the film.	2-2 <i>Valid.</i>
25X1	...in the [] processor, agitation is more vigorous than in contemporary processing systems. Therefore, [] local effects due to bromide concentration can be expected to be greatly reduced or eliminated...	2-17 <i>Probably valid - will have to ascertain when here.</i>
25X1		
10	The processor will accept standard, commercially available, prepackaged liquid chemicals which can be poured directly into the chamber-filling spouts. The machine will be provided with a replenishment system of sufficient capacity to process at least 1000 feet of film 9- $\frac{1}{2}$ inches wide.	2-4 <i>Requires constant replenishment (test form) for long term this (see above)</i> 2-10 <i>Bottle type - unsatisfactory</i>
11	...it is possible to obtain optimum quality under a wide range of circumstances. This is achieved by selectively matching conditions of subject matter, film, exposure, chemistry, temperature, and processing speed. This technique is facilitated because chamber capacities are small, chambers can easily be drained and refilled, and chemical analysis is unnecessary.	2-4 <i>Valid.</i>
25X1	12 The prototype wide-film [] will consist of the following major components:	2-5 <i>Valid.</i>
	1) Load Station 2) Processing Section 3) Drier Section 4) Takeup Station 5) Film Transport Mechanism 6) Machine Controls 7) Pumps, Blowers, and Heaters as required 8) Provision for Plumbing, Venting, and Electrical Connections 9) Replenishment System 10) Overflow and Drainage System	

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13 The machine will operate under daylight (room ambient conditions), after attaching a daylight magazine that has been loaded in a darkroom. Alternately, the machine will be capable of darkroom operation by feeding film from a load spindle under safelight conditions, or in total darkness.

2-6

Valid.

14 Convenience of threading will be emphasized in the design. The threading operation will not require more than 10 feet of film (or leader). Likewise, the machine will not require more than 10 feet of trailer for optimum film transport or processing to the end of the film.

2-6 *Probably closer to 30 feet due to new dryer design.*

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plans to extend convenient manual threading into equipment for wider films. ...

2-6 ?

25X1

There is every reason to anticipate that self-threading of film can be accomplished in wide-film machines.

2-7 *No - cannot be done.*

15 The load and takeup stations will accommodate up to 1000 feet of standard base films.

2-9 *500 ft. by mutual agreement - we do not handle anything over 500.*

16 The machine design will feature a short film path. The distance from entry to the wet section to the exit of the drier shall not exceed 8 feet.

2-8 *see #14 above.*

17 The machine will produce no deleterious effect to the film.

2-8 *Valid.*

...made to insure proper tracking and even takeup. Drier design will be aimed at efficient surface-water removal, and optimum air flow and temperature to thoroughly dry the film at the recommended processing speed.

2-10

Valid.

18 The machine will have an average processing speed of 10 feet per minute when used to process standard aerial films with standard chemicals whose chemical concentrations and temperatures have been tailored to the machine design.

2-8

0'-25' possible.

<u>Item</u>	<u>Statement</u>	<u>Proposal Page No.</u>
	The machine will have a continuously variable film-transport control with a transport speed range of 0 to 15 feet per minute.	2-9 <i>0-25'</i>
25X1 19	Present tests being conducted on standard emulsions [] indicate that a density variation of not more than $\pm .05$, at a nominal density of 1.0 can readily be achieved. During the proposed study contract it is felt that a density variation can be controlled to 0.05 with a design goal of 0.02.	2-9 <i>Valid?</i>
20	Temperature control of chemicals in the processing section will be maintained within $\pm \frac{1}{2}^{\circ}\text{F}$, when measured at the sensing probe. The temperature control range will be continuously variable from 68° to 160°F .	2-9 <i>Valid but dependent upon replenishment heaters largely.</i>
21	Film processed in the 70mm to $9\frac{1}{2}$ -inch Sepratron will meet archival standards for its film class and its residual thiosulphate as specified in American Standards Specification for "Photographic Films for Permanent Records," ASA PH 1.28 - 1957. (maximum residual thiosulphate of 0.005 milligram per square inch).	2-10 & 2-4 <i>Valid.</i>
22	The machine will be designed to operate from 115/208 volt, 60-cycle power.	2-10 <i>Valid</i>
23	The machine will be provided with suitable types of standard plumbing, venting, and electrical connections.	2-10 <i>Valid</i>
24	...because aerial films of both original and duplicating types normally have standard pelloid backings or no backing. Some have an antistatic coating. Any backing layer, such as those normally present on aerial films, will be processed successfully []	2-14 <i>Valid</i>
25X1 25	Under ambient conditions normal to most processing, refrigeration is not required with the heat-shock technique. Therefore, the complexity and package size of the processor is greatly reduced.	2-15 <i>Not using heat shock.</i>

Item

Statement

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At the conclusion of program, a final report, a manual of operation and maintenance instructions, and two reproducible copies of all sketches and drawings required in the fabrication of the prototype will be supplied to the customer.

1-5 Will be combined
as report & ops manual.
Asked for only orig drawings
- Jan 1969.

The following details have been added to the contract statement of work by the DED contract monitor.

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